

TITLE OF THE INVENTION

MOBILE COMMUNICATION DEVICE AND DATA COMMUNICATION
METHOD USING THE SAME

5 BACKGROUND OF THE INVENTION

Field of the Invention

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[0001] The present invention relates to a mobile communication device, and more particularly to a mobile communication device to be coupled to both an external device having a short-distance wireless communication function and a server on a network in a manner to enable communications for exchanging data with the external device and the server in accordance with a predetermined protocol.

15 Description of the Background Art

[0002] In recent years, mobile terminals having Internet connection capabilities have rapidly been gaining prevalence. Such mobile terminals permit users to have access to the Internet free from time or space limitations. Various contents and services which are provided on the Internet are available to users of such mobile terminals.

[0003] Some mobile terminals are provided with not only an Internet communication function but also an infrared communication function for enabling exchange of data with an external device located in the neighborhood of the mobile

terminals. A user may utilize the infrared communication function to transfer telephone directory information, address book information, and/or schedule information, etc., from a mobile terminal to a personal computer, or vice versa.

5 [0004] An example of a service which is currently available through the use of such mobile terminals may be a discount service which a user can exploit at a brick-and-mortar store. Under such a discount service, for example, a user who has registered his or her personal information with a service-providing entity by
10 using a mobile terminal becomes entitled to discount coupons. The user is allowed to use the discount coupons when making a purchase at a store associated with the service-providing entity. Then, the service-providing entity may take a consolidated look at the information concerning the usage of discount coupons and results
15 of questionnaires (which may be filled out, for example, at the time when a user registers his or her personal information), which could facilitate its market surveys. Hereinafter, such a conventional discount service system will be further described.

[0005] FIG. 7 shows the overall structure of an exemplary
20 discount service system. This discount service system comprises a mobile terminal 701 to be used by a user on-the-go, a server 702 which is managed by a service-providing entity, and a cash register terminal 703. The mobile terminal 701 and the server 702 are coupled to each other in a manner to enable communication
25 therebetween via wireless Internet access. The mobile terminal

701 and the cash register terminal 703 are coupled to each other in a manner to enable communication therebetween via infrared communication. The cash register terminal 703 and the server 702 are coupled to each other via an intranet installed within the service-providing entity.

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[0006] FIG. 8 illustrates a sequence of operations to be performed under an exemplary discount service system. First, a user uses the mobile terminal 701 to register his or her personal information with the server 702 via a wireless base station 704 and the Internet. After the registration of the personal information is completed, the server 702 transmits discount coupons to the mobile terminal 701. Then, when making a purchase, the user may transmit a discount coupon from the mobile terminal 701 to the cash register terminal 703 via infrared communication, in order to enjoy a discount in accordance with the discount coupon transmitted. Thereafter, usage information concerning the use of the discount coupons is transmitted from the cash register terminal 703 to the server 702, and the previously-registered personal information is transmitted from the server 702 to the cash register terminal 703. Thus, the personal information and the usage information can be subjected to a consolidated examination.

[0007] FIG. 9 illustrates an exemplary structure of a conventional mobile terminal 701. The operation thereof will be briefly described. Via wireless Internet access, an Internet

reception section 901 receives data from a predetermined URL (which corresponds in this case to the server 702) on the Internet. Via infrared communication, a short-distance wireless reception section 902 receives predetermined data from a nearby-located external device (which corresponds in this case to the cash register terminal 703). A data processing section 909 controls the communications in accordance with a predetermined protocol (e.g., the operation sequence shown in FIG. 8). Under the control of the data processing section 909, a reception switching section 903 accepts received data from either the Internet reception section 901 or the short-distance wireless reception section 902. The received data is stored in a data storage section 904. Thereafter, the received data, which may be converted to appropriate data for transmission to the server 702 or the external device 703, is passed to a transmission switching section 905 as transmission data (i.e., data to be transmitted). Under the control of the data processing section 909, the transmission switching section 905 supplies the transmission data to an Internet transmission section 906 or a short-distance wireless transmission section 907. Via wireless Internet access, the Internet transmission section 906 transmits the transmission data supplied from the transmission switching section 905 to a predetermined URL on the Internet. Via infrared communication, the short-distance wireless transmission section 907 transmits the transmission data supplied from the transmission switching

section 905 to a nearby-located external device 703.

[0008] Through the above-described operation, the mobile terminal 701 can effectuate data communications with both the server 702 on the Internet and the nearby-located external device 703 in accordance with a predetermined protocol. As a result, various services can be realized through exchanges of predetermined data between the server 702 and the external device 703. Japanese Patent Laid-Open Publication No. 2000-148637 discloses a mobile communication device which can access a nearby-located external device in the above-described manner.

[0009] However, the above-described conventional mobile terminal 701 has a problem in that the data processing section 909 can only perform a fixed process or processes, such that it can only exchange predetermined data with the server 702 and/or the external device 703 in accordance with a predetermined fixed protocol. Therefore, if there is a need to change the communication protocol in the service shown in FIG. 8, e.g., with respect to the sequence with the server 702, the sequence with the cash register terminal 703, the data format of the discount coupons, or the order of data transmission to the cash register terminal 703, the data processing section 909 must itself be re-designed and replaced. This makes it difficult to flexibly support changing services.

[0010] FIG. 10 shows an alternative sequence to the sequence shown in FIG. 8, which is performed by the discount service. In

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this alternative sequence, the mobile terminal 701 must first obtain shop information from the cash register terminal 703, and transfer the shop information to the server 702. However, a mobile terminal 701 which is designed to process the sequence
5 shown in FIG. 8 cannot utilize this discount service because the data processing section 909 does not support this alternative sequence.

SUMMARY OF THE INVENTION .

10 **[0011]** Therefore, an object of the present invention is to provide a mobile communication device which is capable of flexibly supporting various services which require the use of both Internet communications and short-distance wireless communications.

[0012] The present invention has the following features to
15 attain the object above.

A first aspect of the present invention is directed to a mobile communication device for being coupled to an external device having a short-distance wireless communication function and a server on a network in a manner to enable communications
20 for exchanging data with the external device and the server in accordance with a predetermined protocol, comprising: short-distance wireless reception means for receiving data from the external device; network reception means for receiving data from the server; short-distance wireless transmission means for
25 transmitting data to the external device; network transmission

means for transmitting data to the server; instruction data receiving means for receiving instruction data from an external source prior to performing a set of data exchanges, wherein the instruction data indicates a protocol in which the set of data exchanges are to be performed; analysis means for analyzing the instruction data received by the instruction data receiving means; and switching means for selecting one or more of the short-distance wireless reception means, the network reception means, the short-distance wireless transmission means, and the network transmission means to create a data transmission/reception path for allowing the set of data exchanges with the external device and the server to occur in accordance with the predetermined protocol, wherein the predetermined protocol is based on an analysis result of the instruction data by the analysis means.

Thus, according to the first aspect, exchanges of data are made with both an external device having a short-distance wireless communication function and a server on a network in accordance with a protocol which is based on externally-provided instruction data. Therefore, even when a service protocol is changed, for example, it is possible to flexibly support the new service without changing the construction of the mobile communication device itself. As used herein, a "protocol" means a set of parameters governing data communications, e.g., order of data transmission/reception, transmission/reception

destinations for data, and data attributes.

[0013] According to a second aspect based on the first aspect, the instruction data is described in XML (Extensible Markup Language).

5 Thus, according to the second aspect, data described in conventional-used XML may be employed as instruction data, thereby making it easy to introduce a function of interpreting instruction data in the mobile communication device.

[0014] According to a third aspect based on the first aspect,
10 the instruction data comprises an instruction for transferring predetermined data from one of the server or the external device to the other.

Thus, according to the third aspect, the mobile communication device can mediate data between the server and the
15 external device. As a result, even if the server and the external device are not coupled via any communication lines, it is still possible to provide a service utilizing data transfer between the two. For example, data such as discount coupons can be mediated by the mobile communication device between a server and an
20 external device which are not directly coupled to each other.

[0015] According to a fourth aspect based on the first aspect, the instruction data comprises address information for designating a destination to be accessed when exchanging data with the server.

25 Thus, according to the fourth aspect, even if a

destination to be accessed when exchanging data with the server is changed due to alterations made to the service, for example, it is possible to flexibly support the new service without changing the construction of the mobile communication device itself.

5 **[0016]** According to a fifth aspect based on the first aspect, the instruction data comprises a session ID, and the mobile communication device further comprises session ID addition means for adding to transmission data the session ID contained in the instruction data analyzed by the analysis means.

10 Thus, according to the fifth aspect, a session ID is added to transmission data, and thus it is possible to issue a plurality of instruction data so as to be associated with a single session. Consequently, in the case where a given protocol conditionally diversifies into two or more patterns in the middle of a session, two or more instruction data corresponding to the resulting two or more patterns after diversification may simply be provided. As a result, the size of each instruction data can be reduced, thereby making it possible to optimize the utility of the storage capacity in the mobile communication device. Since the contents to be described in the instruction data can be simplified, it is easy to prepare the descriptions in the instruction data.

15 **[0017]** A sixth aspect of the present invention is directed to a data communication method for exchanging data with an external

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device having a short-distance wireless communication function and a server on a network in accordance with a predetermined protocol, by using a mobile communication device coupled to and capable of communicating with the external device and the server, comprising: an instruction data receiving step of receiving instruction data from an external source prior to performing a set of data exchanges, wherein the instruction data indicates a protocol in which the set of data exchanges are to be performed; an analysis step of analyzing the received instruction data; and a data communication step of performing the set of data exchanges with the external device and the server in accordance with the predetermined protocol, wherein the predetermined protocol is based on an analysis result of the instruction data.

Thus, according to the sixth aspect, exchanges of data are made with both an external device having a short-distance wireless communication function and a server on a network in accordance with a protocol which is based on externally-provided instruction data. Therefore, even when a service protocol is changed, for example, it is possible to flexibly support the new service without changing the construction of the mobile communication device itself.

[0018] These and other objects, features, aspects and advantages of the present invention will become more apparent from the following detailed description of the present invention when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] FIG. 1 is a block diagram illustrating the overall configuration of a system employing a mobile communication device
5 according to a first embodiment of the present invention;

FIG. 2 is a block diagram illustrating the structure of a mobile communication device according to the first embodiment of the present invention;

FIG. 3 is a diagram illustrating a specific example of
10 instruction data;

FIG. 4 is a sequence diagram illustrating an exemplary operation of the overall system shown in FIG. 1;

FIG. 5 is a flowchart illustrating the operation of a mobile communication device;

15 FIG. 6 is a block diagram illustrating the structure of a mobile communication device according to a second embodiment of the present invention;

FIG. 7 is a block diagram illustrating the overall configuration of a conventional discount service system;

20 FIG. 8 is a sequence diagram illustrating the operation of a conventional discount service system;

FIG. 9 is a block diagram illustrating the structure of a conventional mobile communication device; and

25 FIG. 10 is a sequence diagram illustrating the operation of another conventional discount service system.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0020] Hereinafter, various embodiments of the present invention will be described with reference to the accompanying
5 figures.

(first embodiment)

FIG. 1 is a block diagram illustrating the overall configuration of a system employing a mobile communication device (shown as a mobile terminal 101) according to a first embodiment
10 of the present invention. The mobile terminal 101 has a wireless Internet communication function and an infrared communication function. The mobile terminal 101 is coupled to a server 102 via a wireless base station 104 and the Internet so as to be capable of communicating therewith. The mobile terminal 101 is also
15 coupled to a nearby-located cash register terminal 103 via infrared communication so as to be capable of communicating therewith. Although the server 102 and the cash register terminal 103 are shown as being managed by a single service-providing entity in FIG. 1, the illustrated system is only exemplary, and
20 the present invention is not limited thereto.

[0021] Although the mobile terminal 101 is illustrated as being coupled to the server 102 via the Internet, the present invention is not limited thereto; alternatively, the mobile terminal 101 may be coupled to the server 102 via any other network
25 (e.g., an intranet). Although the mobile terminal 101 and the

cash register terminal 103 are illustrated as being coupled via infrared communication, the present invention is not limited thereto; alternatively, the mobile terminal 101 and the cash register terminal 103 may be coupled in a manner to enable
5 communication with each other via any other mode of short-distance wireless communication (e.g., Blue Tooth).

[0022] With reference to FIG. 2, the mobile communication device 101 will be described. As shown in FIG. 2, the mobile communication device 101 includes an Internet reception section
10 201, a short-distance wireless reception section 202, a reception switching section 203, a data storage section 204, a transmission switching section 205, an Internet transmission section 206, a short-distance wireless transmission section 207, an instruction data receiving section 208, and an instruction data analysis
15 section 209. Hereinafter, the operation of the mobile communication device 101 will be described.

[0023] The Internet reception section 201 receives data over the Internet, and passes the received data to the reception switching section 203. The short-distance wireless reception
20 section 202 receives data from the external device 103 having an infrared communication function, and passes the received data to the reception switching section 203. Under the control of the instruction data analysis section 209, the reception switching section 203 receives data from either the Internet reception
25 section 201 or the short-distance wireless reception section 202,

and outputs the received data to the data storage section 204. The data storage section 204 stores the data from the reception switching section 203, and outputs the stored data under the control of the instruction data analysis section 209. Under the control of the instruction data analysis section 209, the transmission switching section 205 outputs data to either the Internet transmission section 206 or the short-distance wireless transmission section 207. The Internet transmission section 206 outputs the data from the transmission switching section 205 onto the Internet. The short-distance wireless transmission section 207 transmits the data from the transmission switching section 205 to an external device (e.g., the cash register terminal 103) via short-distance wireless communication. The instruction data receiving section 208 receives instruction data from an external source, and outputs it to the instruction data analysis section 209. The instruction data analysis section 209 analyzes the instruction data received by the instruction data receiving section 208, and controls the reception switching section 203 and the transmission switching section 205 based on the analysis result.

[0024] As described above, the mobile communication device 101 exchanges data with the server 102 on the Internet, and with the cash register terminal 103 via infrared communication. The transmission/reception protocol of the mobile terminal 101 is controlled based on the instruction data. The instruction data

may be stored in the server 102 on the Internet, and supplied to the mobile terminal 101 over the Internet. Note that the instruction data does not need to be provided over the Internet, but may be provided from an external source in any manner, e.g.,
5 via some form of communications.

[0025] FIG. 3 is a diagram illustrating a specific example of the instruction data. In this specific example, the instruction data is described in XML (Extensible Markup Language). In FIG. 3, the instruction data 301 includes: an XML declaring portion 302
10 which declares that this data is described in XML and thus designates a method for interpreting the data; and a data describing portion 303, in which data concerning the actual transmission/reception sequence is described. The instruction data 701 does not need to be described in XML, but may be described
15 in any other language.

[0026] Now, the data describing portion 303 will be described in detail. As shown in FIG. 3, the data describing portion 303 includes a session ID describing portion 304, an infrared data transmission describing portion 305, an Internet transmission
20 describing portion 306, an Internet reception describing portion 307, and an infrared data reception describing portion 308. The session ID describing portion 304 designates a session ID. The infrared data transmission describing portion 305 includes a <writeData> tag, which describes that data is to be transmitted
25 via infrared communication, together with a description of the

data for transmission via infrared communication. The Internet transmission describing portion 306 describes that data is to be received via infrared communication, and that the received data is to be transmitted to a server which is indicated within a <writeDataToURL> tag. The Internet reception describing portion 307 describes that data is to be received via the Internet from a server which is indicated within a <readDataFromURL> tag, and that the data is to be transmitted to an external device coupled via infrared communication. The infrared data reception describing portion 308 includes a <readData> tag, which describes that data is to be received via infrared communication, together with a description of the content of the data. Note that these tags are sequentially processed from top to bottom. By changing the types, order, combination, and contents of these tags as necessary, it is possible to describe a protocol which is required to realize a desired service in the form of instruction data.

[0027] Next, the operation of the mobile terminal 101 based on the instruction data 301 shown in FIG. 3 will be specifically described. FIG. 4 illustrates a sequence of operations of the mobile terminal 101, the server 102, and the cash register terminal 103. Prior to performing the protocol shown in FIG. 4, the mobile terminal 101 receives the instruction data 301 from the server 102 over the Internet. The data exchange shown in FIG. 4 occurs based on the received instruction data 301. Based on the infrared data transmission describing portion 305, the

mobile terminal 101 transmits a shop number requesting command
"Give me Shop No." to the cash register terminal 103 via infrared
communication. At this point, under the control of the
instruction data analysis section 209, the transmission switching
5 section 205 passes the shop number requesting command to the
short-distance wireless transmission section 207. Next, based
on the Internet transmission describing portion 306, the mobile
terminal 101 receives a shop number from the cash register
terminal 103 via infrared communication, and transmits the
10 received shop number to a URL (i.e., the server 102) which is
designated by the Internet describing portion 306 over the
Internet. At this point, under the control of the instruction
data analysis section 209, the reception switching section 203
receives the shop number from the short-distance wireless
15 reception section 202, and the transmission switching section 205
passes the shop number to the Internet transmission section 206.
Next, based on the Internet reception describing portion 307, the
mobile terminal 101 receives a discount coupon from the designated
URL over the Internet, and transmits the discount coupon to the
20 cash register terminal 103 via infrared communication. At this
point, under the control of the instruction data analysis section
209, the reception switching section 203 receives the discount
coupon from the Internet reception section 201, and the
transmission switching section 205 passes the discount coupon to
25 the short-distance wireless transmission section 207. Next,

based on the infrared data reception describing portion 308, the mobile terminal 101 receives a notice of completion, i.e., "End", from the cash register terminal 103 via infrared communication. At this point, under the control of the instruction data analysis section 209, the reception switching section 203 receives the notice of completion from the short-distance wireless reception section 202. Any data transmission/reception over the Internet described above may be performed via HTTP communications.

[0028] In the example protocol shown in FIG. 4, the server 102 may designate a discount value on the basis of the shop number received from the cash register terminal 103 via the mobile terminal 101, whereby it becomes possible to provide a discount service in which different shops are associated with different discount values. In one variant thereof, the server 102 may issue different instruction data to the mobile terminal 101 depending on the shop number, whereby it becomes possible to provide different versions of services for different shops. For example, discount coupons may be unconditionally issued for some shops, while other shops may require the user to have filled out a questionnaire before the user can be entitled to discount coupons. It will be appreciated that the above-described protocol and its variant can be realized through the use of any information, instead of a shop number, that identifies an external device to be coupled via short-distance wireless communication. Thus, a service which is adapted to the whereabouts of a user can be easily

provided.

[0029] FIG. 5 is a flowchart illustrating the overall operation of the mobile terminal 101. In order to qualify for a service, the mobile terminal 101 first receives instruction data from the server 102 (step S501). Next, the mobile terminal 101 analyzes the received instruction data (step S502). Then, with a protocol based on the analysis result, data communication processing (e.g., a sequence of processes as shown in FIG. 4) is performed (step S503).

10 [0030] As described above, according to the first embodiment of the present invention, data exchanges can be performed with both an external device having a short-distance wireless communication function and a server on a network in accordance with a protocol which is based on externally-provided instruction data. Accordingly, even when a service protocol is changed, it is possible to flexibly support the new service without changing the construction of the mobile communication device itself.

[0031] (second embodiment)

FIG. 6 is a block diagram illustrating the structure of a mobile communication device according to a second embodiment of the present invention. In FIG. 6, any component elements which also appear in FIG. 2 are denoted by the same reference numerals as those used therein, and the descriptions thereof are omitted. The structure shown in FIG. 6 differs from that shown in FIG. 2 in that a session ID addition section 610 is additionally

comprised. The overall system configuration employing the mobile communication device shown in FIG. 6 may be the same as that shown in FIG. 1. Hereinafter, the operation according to the second embodiment will be described with a focus on the processes which involve the session ID addition section 610.

5 [0032] The instruction data receiving section 208 receives instruction data from the server 102 over the Internet. Based on the session ID describing portion 304 of the instruction data 301, the instruction data analysis section 209 reads a session
10 ID, and passes it to the session ID addition section 610. The session ID addition section 610 adds the session ID passed from the instruction data analysis section 209 to transmission data which is to be transmitted via the transmission switching section 205.

15 [0033] Thus, the second embodiment not only attains the same effects as those under the first embodiment, but also makes it possible, by the addition of a session ID to transmission data, to issue a plurality of instruction data so as to be associated with a single session. Consequently, even in the case where a
20 given protocol conditionally diversifies into two or more patterns in the middle of a session, two or more instruction data corresponding to the resulting two or more patterns after diversification may simply be provided. As a result, the size of each instruction data can be reduced, thereby making it
25 possible to optimize the utility of the storage capacity in the

mobile communication device. Since the contents to be described in the instruction data can be simplified, it is easy to prepare the descriptions in the instruction data.

[0034] While the invention has been described in detail, the
5 foregoing description is in all aspects illustrative and not restrictive. It is understood that numerous other modifications and variations can be devised without departing from the scope of the invention.

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